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15 A method of determining parameters of formations through which a borehole passes, on the basis of a resistivity log recorded in the borehole by means of a measuring and recording tool, the method comprising the steps of:

(i) determining the formation parameters by a quasi-Newton parameter inversion method implemented on pseudo-parameters that are homogeneous and that are determined from the formation parameters so as to obtain a model of the formations;

(ii) calculating the response of the tool to the model;

(iii) using a comparison criterion for comparing the calculated response with the recorded log;

(iv) performing at least one new iteration if the comparison criterion is not satisfied; and

(v) determining the formation parameters from the calculated response.

16 A method as claimed in claim 15, further comprising determining boundaries between geological beds prior to implementing the quasi-Newton method.

17 A method as claimed in claim 16, further comprising determining the bed boundaries on the basis of points of inflection in log data.

18 A method as claimed in claim 16, further comprising selecting a bed model for each geological bed prior to implementing the quasi-Newton method.

19 A method as claimed in claim 18, wherein the bed model comprises parameters concerning distance from the borehole axis so as to define radial zones about the axis, and a resistivity parameter within each radial zone defined in this manner.

20 A method as claimed in claim 15, further comprising selecting observable magnitudes.

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21 A method as claimed in claim 20, wherein selecting the observable magnitudes includes defining a combination of data items from the log.

22 A method as claimed in claim 18, further comprising selecting observable magnitudes and giving each observable magnitude a value for each geological bed.

23 A method as claimed in claim 22, wherein the step of giving each observable magnitude a value for each geological bed comprises interpolating, within each layer, values of the observable magnitude as determined within each bed.

24 A method as claimed in claim 22, wherein each observable magnitude is given a value for each geological bed by giving the observable magnitude the value it possesses at a measurement point closest to the middle of the bed.

25 A method as claimed in claim 15,wherein the step of determining parameters from log data by a quasi-Newton method is performed by estimating the Jacobian of the problem by Broyden's method.

26 A method as claimed in claim 15, wherein the log used is an R_{LLs} and R_{LLd} log.

27 A method as claimed in claim 15, wherein the log used is an R_{LA1}, ..., R_{LA5} log.

28 A method of determining the parameters R_t, R_{x0}, and d_i of formations through which a borehole passes, on the basis of a resistivity log recorded in the borehole by means of a measuring and recording tool, the method comprising the steps of:

(i) determining the formation parameters by a quasi-Newton parameter inversion method implemented on pseudo-parameters that are homogeneous and that are determined from the formation parameters so as to obtain a model of the formations;

(ii) calculating the response of the tool to the model;

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(iii) using a comparison criterion for comparing the calculated response with the recorded log;

(iv) performing at least one new iteration if the comparison criterion is not satisfied; and

(v) determining the parameters R_t, R_{x0}, and d_i from the calculated response.

29 A method as claimed in claim 28, further comprising determining boundaries between geological beds prior to implementing the quasi-Newton method.

30 A method as claimed in claim 29, further comprising determining the bed boundaries on the basis of points of inflection in log data.

31 A method as claimed in claim 29, further comprising selecting a bed model for each geological bed prior to implementing the quasi-Newton method.

32 A method as claimed in claim 31, wherein the bed model comprises parameters concerning distance from the borehole axis so as to define radial zones about the axis, and a resistivity parameter within each radial zone defined in this manner.

33 A method as claimed in claim 28, further comprising selecting observable magnitudes.

34 A method as claimed in claim 33, wherein selecting the observable magnitudes includes defining a combination of data items from the log.

35 A method as claimed in claim 31, further comprising selecting observable magnitudes and giving each observable magnitude a value for each geological bed.

36 A method as claimed in claim 35, wherein the step of giving each observable magnitude a value for each geological bed comprises interpolating, within each layer, values of the observable magnitude as determined within each bed.

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37 A method as claimed in claim 35, wherein each observable magnitude is given a value for each geological bed by giving the observable magnitude the value it possesses at a measurement point closest to the middle of the bed.

38 A method as claimed in claim 28,wherein the step of determining parameters from log data by a quasi-Newton method is performed by estimating the Jacobian of the problem by Broyden's method.

39 A method as claimed in claim 28, wherein the log used is an R_{LLs} and R_{LLd} log.

40 A method as claimed in claim 28, wherein the log used is an R_{LA1}, ..., R_{LA5} log.

Respectfully submitted,

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By: Brigitte L. Jeffery
Brigitte L. Jeffery
Registration N° 38,925

Schlumberger Technology Corporation
200 Gillingham Lane
Sugar Land, Texas 77478
(281) 285-7067